4) The cost of structural investment and installing cables is apparently estimated as a linear function of the cost of cable.[123] A better alternative would be to estimate these costs directly. Moreover, the model appears to assume that these structural costs will always be equally shared by a cable company and an electric utility. This probably leads to an understatement of the cost-of-service.

5) Some of the cost data used in the model were obtained through conversations between Hatfield Associates' employees and industry experts.[124] This informal process makes the model less open, but it is unavoidable in a world in which the local exchange companies claim that their own cost data are proprietary.

Accuracy of proxy models

The National Exchange Carrier Association (NECA) has compared the loop cost estimates of the BCM with the embedded costs that are used to determine eligibility for the high-cost fund. NECA found that the proxy model estimates "for smaller companies vary greatly from actual costs. These variances, which are due in part to 'mapping' problems between census block groups and actual operating territories of small companies, may not be a significant problem for larger companies because the errors produced by the models tend to 'average out' over the large number of census block groups served by these companies. For smaller companies, serving only a few census block groups, such errors can be devastating."[125]

---

[123]Proposed Decision of the Administrative Law Judge in "Rulemaking on the Commission's Own Motion into Universal Service," California Public Utilities Commission, R.95-01-120, pp. 100-103, August 5, 1996.

[124]Ibid., p. 109.

[125]*In the Matter of Common Carrier Bureau Seeks Further Comment on Specific Questions in Universal Service Notice of Proposed Rulemaking*, CC Docket No. 96-45, National Exchange Carrier Association, "Further Comments," August 2, 1996, p. 22.

Overall NECA found that the BCM2 tracked well with the embedded cost-of-service. Based on an analysis of 1,386 out of 1,439 separations study areas, the association found that the model estimated an annual cost per loop of $277, $35 greater than the embedded cost of $242.[126] Some proponents of the BCM2 have suggested that the small differences between the embedded and the current estimated cost are a sign that the model is accurate, because embedded costs are the standard against which proxy models should be evaluated. If matching embedded costs were a sign of a good model, there would be a reduced need to develop engineering economic models. If embedded costs are the correct standard, then they should be the starting point for setting rates.

However, embedded costs are not the starting point for setting the price of unbundled network elements. In setting the rates for interconnection, the States are obligated to evaluate the justness and reasonableness of a rate. They do this by comparing the price with the economic, rather than the embedded, cost-of-service.[127] Since the BCM2 tracks well with embedded costs, the question naturally arises, is it the case that there is little difference between the embedded and economic cost-of-production?

There is considerable evidence to suggest that the economic cost-of-production is less than the embedded cost. Telephone company cost studies have shown that the cost of the loop has been decreasing over time. For example, cost studies undertaken by Indiana Bell indicate that between 1984 and 1992, the marginal cost of providing a local loop declined by 8.1% per annum in logarithmic terms.[128] In the unbundling docket at the FCC, the USTA noted that the economic cost-of-production

---

[126]Ibid., p. 5. Similar findings have been made by other parties. For example, Southwestern Bell reported that the BCM2 reported higher economic investments and expenses for the loop than the embedded cost-of-service in four out of the five States it serves. *In the Matter of Common Carrier Bureau Seeks Further Comment on Specific Questions in Universal Service Notice of Proposed Rulemaking*, CC Docket No. 96-45, "Supplemental Comments of Southwestern Bell Telephone Company on Cost Proxy Models," August 9, 1996, pp. 6-7.

[127]Section 252(d)(1) says rates: "(A) shall be (I) based on the cost (determined without reference to a rate-of-return or other rate-based proceeding) of providing the interconnection of network element (whichever is applicable), and (ii) nondiscriminatory, and (B) may include a reasonable profit."

[128]Prepared Testimony of David Gabel, Cause No. 39705, Indiana Utility Regulatory Commission, January 1994.

is continues to go down. The trade association suggested that the difference in the cost-of-production was in the range of $13 billion to $18.4 billion.[129]

BellSouth's proposal

BellSouth continues to advocate basing the calculation on average embedded costs, despite the Florida Commission's conclusion that the cost estimates should be based on incremental costs.[130]

The notion of the embedded cost-of-service has less and less meaning in today's evolving telecommunications markets. There are at least three reasons why the Commission should continue to reject basing the measurement of universal service costs on embedded costs.

First, the increased reliance on price-caps at both the State and Federal levels has reduced the weight given to the accounting cost-of-production. In the current universal service proceeding before the Federal Communications Commission, William Taylor advocated on behalf of BellSouth that embedded costs should be used to determine the initial level of universal service support.[131] Only a few years ago, the LECs told commissions that ratebase regulation was inefficient and caused the ratebase to exceed the level associated with an efficient level of production. For example, William Taylor asserted on behalf of New England Telephone in 1990 that ratebase regulation "does not lead to economically efficient behavior, either in the short run or over time. In the short run, the cost-plus

---

[129]In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No. 96-325 and 96-98; and *Interconnection between Local Exchange Carriers and Commercial Mobile Radio Service Providers,* CC Docket No. 95-185, First Report and Order, Adopted: August 1, 1996, Released: August 8, 1996, paragraph 641, footnote 1563, and paragraph 658.

[130]"The Universal Service Preservation Fund: A Proposal by BellSouth Telecommunications," March 27, 1996, p. 8.

The embedded cost is the cost incurred at the time an input or resource is purchased, which is not necessarily equal to the economic (current or future) cost of replacing the input or resource.

[131]Kenneth Gordon and William E. Taylor, "Comments on Universal Service," pp. 2, 6, 9-10, April 12, 1996, attachment to "Comments," BellSouth Corporation, "In the Matter of Federal-State Joint Board on Universal Service," CC Docket No. 96-45, April 12, 1996.

nature of rate of return regulation gives the firm no incentive to produce at the minimum cost given its technology." Taylor added that inefficiencies also occur under ratebase regulation because the LECs lack "incentives to develop new services and expand demand" and face "perverse incentives regarding the choice of factors of production."[132] When it comes to setting the price of interconnection, Taylor claimed in 1994 that "the only reasonable assumption is the commission has set...retail prices at levels...just sufficient to enable the utility company to earn its necessary return on invested capital."[133] He also submits that since the local exchange companies have been regulated, it is fair to assume that the investments have been "prudently undertaken."[134] Taylor's position is logically inconsistent—he contends that costs are imprudently incurred under ratebase regulation but prudently acquired when their reasonableness is challenged in the context of setting prices of inputs sold to competitors. If these inefficient investments are reflected in the determination of the initial level of universal service support, consumer welfare will be harmed.

At least one bypass study, undertaken by Ameritech, suggests that the cost burden of the LECs' failure to minimize the cost-of-production is large. In the mid-1980s, Ameritech argued before the State commissions and the FCC that it was necessary to increase customer access line charges and to reduce rates to long-distance carriers in order to minimize the impact of "uneconomic bypass." In support of this assertion, Ameritech developed an economic choice model that estimated bypass potential. Using customer-specific demand data, cost estimates of bypass technology, and current tariff rates, Ameritech estimated the amount of traffic and revenue that might be lost to bypass. During that time period, the major, if not the principal, bypass technology was T-carrier, generally transmitted via copper cable. Ameritech's procedure for estimating the cost of a rival's copper costs provides an interesting datum on the potential difference between efficient and embedded cost levels: "For all systems, engineering and installation costs are based on...Bell broad gauge costs for underground

---

[132]William Taylor, *Incentive Regulation in Telecommunications* (Cambridge, MA: National Economic Research Associates, 1990), pp. 4-6.

[133]Alfred Kahn and William Taylor, "The Pricing of Inputs Sold to Competitors: Comment," *Yale Journal of Regulation* 11, no. 1 (1994): p. 232.

[134]Ibid., p. 236.

[cable]...However, these costs were reduced roughly 50 percent to account for lower competitive labor rates, engineering requirements, and loadings."[135] This passage states unambiguously that Ameritech installed facilities at a much greater cost than its rivals. These higher expenses have now become part of Ameritech's ratebase. It would be economically inefficient to allow Ameritech, or any other LEC, to recover its admittedly inefficient costs from more efficient rivals.

Second, because of the LECs' increased interest in providing video services via facilities used in common with voice products, it has become increasingly difficult to determine which portion of the ratebase is associated with monopoly telecommunications services. Therefore, before the embedded cost-of-service can be used to determine the magnitude of the universal service support, it must first be determined that the ratebase has not been inflated by inefficient operations or by expenses that are not attributable to traditional telecommunications services.[136] This is not a simple undertaking and, therefore, the Commission should be wary of assertions that using embedded costs provide administrative simplicity.[137]

Third, the Act reflects a series of compromises between interested parties. While the LECs are required to price interconnection on the basis of the economic cost-of-production, they are afforded the opportunity to enter new markets (for example, manufacturing, interLATA toll, and video services). The clear intent of Congress was to foster efficient rivalry in telecommunications markets.

---

[135]Ameritech, "Effects of Access Pricing Policies on Customers of the Ameritech Companies," Ameritech submission to the FCC, October 2, 1984, 11-2. Customers of the bypass systems report that the private networks provided service quality that was superior to that which was available through the LECs. See, for example, Eli Noam, "The Public Telecommunications Network: A Concept in Transition," vol. 37 (1987) *Journal of Communications* p. 30; and Jane L. Racster, Michael D. Wong, and Jean-Michael Guldmann, *The Bypass Issue: An Emerging Form of Competition in the Telephone Industry*, (Columbus, OH: The National Regulatory Research Institute, 1984), publication 84-17.

[136]Not only would the embedded costs associated with providing high-speed data and video services have to be identified, but the Commission would also have to separate out the cost of vertical, toll, private line, and other services that are not components of universal-service-related products.

[137]Gordon and Taylor have asserted that administrative simplicity would be achieved through the use of embedded costs. "Comments on Universal Service," p. 15.

In order to promote entry, Congress required that the local exchange companies open up their markets in return for the opportunity to provide new products. If the universal service fund is set to recover a portion of the embedded cost-of-service, at a level that even the LECs characterize as including inefficient costs, the Act's goals will not be achieved. If the price of interconnection, via a universal service levy, is raised for the purpose of recovering the LECs' embedded costs, then inefficient facility-based entry will be encouraged. In order for correct entry decisions to be made, entrants must pay a price that reflects the economic cost-of-production.

Neither is BellSouth's proposal competitively neutral. Taylor and Gordon have submitted that the amount of universal service support should initially be set at the difference between the incumbent's embedded cost per line and the price of exchange service. They suggest that this level of support might be reduced by the "difference between the incumbent's LRIC [long run incremental cost] and the entrant's (lower) LRIC."[138] This approach would allow the incumbent to earn a rent that would be denied to the entrant. If no entry occurred, the incumbent would be permitted to recover the full rent—the difference between its incremental cost and the price of exchange service.

Depreciation reserve shortfall

BellSouth has petitioned regulatory commissions for the authority to recover some of its claimed depreciation reserve deficiency. This depreciation shortfall is part of the Company's embedded costs. The Company argues that the alleged deficiency "represents a cost arising from past regulatory actions..."[139]. Such a view is difficult to understand. First, in order for the regulators to be fully at fault for any alleged depreciation shortfall, the LECs would have had to have been omniscient and fully

---

[138]Kenneth Gordon and William E. Taylor, "Comments on Universal Service," p. 9, 14 (quote). Appendix to BellSouth Corporations comments in Federal-State Joint Board on Universal Service, CC Docket No. 96-45, April 12, 1996. Their proposed method is flawed because it fails to take into account that the loop and switch are also used to provide other services. Since these common and joint costs are included in the embedded cost calculation, in order to be logically consistent, the appropriate revenue would include the contribution from other switched services that share these facilities.

[139]"The Universal Service Preservation Fund," March 27, 1996, p. 10, 14 (quote).

anticipated all the changes in technology and input prices, as well as the demand for different products. Second, the commissions would have had to disregard the evidence. Third, the risk of capital under-recovery would have had to have been ignored by the capital markets. And, finally, the LECs would have had to have been denied the right to adequate capital recovery, not only by the commissions, and through its cost-of-capital, but also by the courts.

Auctions

Unlike BellSouth, GTE believes that a cost model should be used to estimate the cost of providing universal service products. GTE believes that a cost model can be used in the short run, but they feel that a better long-term solution for determining the magnitude of the universal service obligation is to have parties bid for the service contracts to high-cost areas.[140] The Florida Commission has pointed out that, depending on the design of the auction process, competitive bidding might violate Section 214(e) (2) of the 1996 Telecommunications Act.[141]

There are some important administrative issues that should also be considered before using auctions. For example, NECA has expressed its concern that the bidding process would lead to a reduction in the quality of service. The carriers are concerned that the low bidder will reduce its service standards in order to operate profitably at the low subsidy level. Quality-of-service standards are used widely in the industry. When service standards are violated, commissions are empowered to impose financial penalties. The Commission should continue to rely on such a mechanism in order to ensure that service provisioning does not deteriorate in the event that a bidding scheme is adopted.[142]

---

[140]"Universal Service in a Competitive Environment," GTE, February 14, 1996.

[141]"Comments," Florida Public Service Commission, "In the Matter of: Federal-State Joint Board on Universal Service," p. 11, CC Docket No. 96-45, April 11, 1996.

[142]Where rivalry exists, competitive pressures will generally compel firms to improve service.

NECA also expressed their concern that the bidding process will be costly.[143] TCI noted that the bidding process may not work, because there will be a limited number of facility-based suppliers in the near future. Consequently, there will be fewer markets, or bidders, for the universal service areas.[144]

The subsidies are only intended to cover the cost of serving high-cost areas. The developers of the proxy models have argued that cost modeling should be done at the census block group level in order to ensure that subsidies flow only to high-cost areas.[145] This fine level of granularity causes problems when the information is used at an auction. First, the large number of areas identified by the study makes the number of auctions large and, therefore, costly to conduct. Second, census block groups are designed to have an average of 400 households. This is a value that is less than a typical serving or carrier serving area in a telecommunications network. Thus, it does not correspond with efficient telecommunications engineering practices. The winning bidder could be cursed with a serving territory that does not correspond to the territory that would be served by an efficiently designed loop plant.

---

[143]*In the Matter of Common Carrier Bureau Seeks Further Comment on Specific Questions in Universal Service Notice of Proposed Rulemaking*, CC Docket No. 96-45, National Exchange Carrier Association, "Further Comments," August 2, 1996, p. 29.

[144]*In the Matter of Common Carrier Bureau Seeks Further Comment on Specific Questions in Universal Service Notice of Proposed Rulemaking*, CC Docket No. 96-45, "Comments of Tele-Communications, Inc.," August 2, 1996, pp. 31-32.

[145]"Benchmark Cost Model 2: Methodology," n.d., n.a., p. 1, distributed at NEPUC meeting September 5, 1996.

CHAPTER IV: Recommendations regarding Universal Service Issues

Summary

Chapter 364.025(4) of the Florida Statutes requires that the commission make recommendations on a number of issues no later than January 1, 1997. I recommend that you urge the PSC to adopt the following responses to the questions raised by the legislature:

Is a subsidy necessary?

A mechanism is needed to identify which costs, if any, are associated with providing universal service. The cost of universal service should be defined in terms which reflect the decisions that a network operator would normally make in a commercial environment, absent the universal service obligations.

What is the minimum amount needed? What mechanism should be used to collect the funds?

In the proceeding which addressed the interim funding of the universal service obligation, the Commission concluded that the LECs had not demonstrated "that for any particular geographic area or class of customers, LEC incremental costs for those customers in Florida exceed LEC revenues for those customers." Neither was evidence provided that "demonstrated that competition will erode [BellSouth's or General Telephone's] ability to sustain [universal service] or [carrier-of-last-resort]" obligations. Therefore, based on the available evidence, residential service is not subsidized. Universal service funding may still be required in order to ensure recovery of universal service objectives or carrier-of-last-resort obligations.[146] But to date, no credible evidence has been provided to support the establishment of such a fund.

---

[146]Re: Determination of funding for universal service and carrier-of-last-resort responsibilities, Florida Public Service Commission, Docket No. 950696-TP, December 27, 1995, p. 28 (second quote), 32 (first quote). The statute does not define the term carrier-of-last-resort. Ibid., p. 9.

The Commission also established an interim mechanism which permitted LECs to petition the Commission for relief if a showing could be made that competition was harming a company's ability to fund their universal service obligations. No local exchange company has filed for such relief.[147]

If such a fund is required, all intrastate providers should contribute on a *pro rata* basis of intrastate revenues. In a submission to the FCC, the Florida Commission suggested that the contribution be based on either gross telecommunications revenues or gross revenues net of intermediary payments to other providers.[148] The final decision on this matter should be delayed until a finding is made that such a collection is needed and the magnitude and nature of the fund is further defined.

What mechanism should be used to distribute the subsidy funds?

Any authorized local exchange supplier should be able to receive money from the universal service fund, assuming that the supplier provides service in those areas which are determined to be in need of universal service support. Auctions could also be used to determine who receives the support, but at this time, the costs of relying on this approach likely exceed the benefits. Further, auctions may be in violation of §214(e) (2) of the 1996 Telecommunications Act.

From whom should the subsidy be collected?

Both the Florida and Federal Statute require that the cost of the universal service obligation should be shared by all telecommunications suppliers or companies who provide telecommunications service.[149] The Federal Law defines telecommunications service to mean "the offering of

---

[147]Ibid., p. 28; §364.025(3); and MFS, "Universal Service & Carrier-of-Last-Resort Mechanism: 14 Points," February 14, 1996.

[148]"Comments," Florida Public Service Commission, "In the Matter of: Federal-State Joint Board on Universal Service," p. 25, CC Docket No. 96-45, April 11, 1996.

[149]The Federal Statute refers to telecommunications carriers. The Florida Statute uses the term telecommunications companies.

The Commission has informed the FCC that it expects "that the entities who would be subject to any intrastate US financial responsibility would in all likelihood significantly overlap those on the interstate side." "Comments," Florida Public Service Commission, "In the Matter of: Federal-State Joint Board on Universal Service," pp. 23-24, CC Docket No. 96-45, April 11, 1996

telecommunications for a fee directly to the public, or to such classes of users as to be effectively available directly to the public, regardless of the facilities used."[150]

The Federal Statute does allow for an exemption for small suppliers whose participation in the fund would only have a small effect on the collected funds. The Federal Law also provides an exemption for resellers of telecommunications services. Similar exceptions do not appear in the Florida Statute but the Commission has noted that "[f]or the very small carriers, the amount of funds to be collected could easily exceed the cost of administration."[151]

Just as the LECs use their per minute rate structure to recover fixed costs of the network, so also should the LECs be allowed to recover fixed costs of the loop in a usage-rate element.

Deaveraging of basic local exchange telecommunications service

The cost of providing universal-service-related products is generally higher in less densely populated areas. If cost were the only basis for setting rates, it would be appropriate to consider deaveraging rates. But, of course, the cost of supplying service is not the only factor that should be required when setting rates.[152]

Deaveraging on the basis of the cost-of-production would likely lead to an increase in the price of exchange service in rural areas, relative to the charges in more densely populated areas. As pointed out by the Commission in its comments to the Joint Board, the scope of deaveraging must not violate the statutory requirement that "consumers in rural and high-cost areas should have access to service at rates reasonably comparable to those charged in urban areas."[153] Deaveraging that leads to significantly higher rates in rural areas would be in violation of the Federal Statute, §254(b)(3):

> Consumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including interexchange

---

[150]§3(a)(2)(49) and §3(a)(2)(51).

[151]"Comments," Florida Public Service Commission, "In the Matter of: Federal-State Joint Board on Universal Service," p. 24, CC Docket No. 96-45, April 11, 1996.

[152]As discussed more fully in chapter three, the record lacks useful information on the cost of serving different areas.

[153]"Comments," Florida Public Service Commission, "In the Matter of: Federal-State Joint Board on Universal Service," p.1, CC Docket No. 96-45, April 11, 1996.

> services and advanced telecommunications and information services, that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas.

The essence of both Federal and State legislation regarding pricing and universal service suggests that the most appropriate regulatory policy regarding basic residential service rates is to establish a relatively inexpensive basic service platform in the proximity of existing rates. If this strategy is adopted, the future competitive struggles in the telecommunications industry will be largely focused around optional, vertical services and packaging, while at the same time ensuring affordable access to all. This approach is diametrically opposite the proposals of many of the local exchange companies who envision that basic customers alone will pay for the cost of the platform (access line), thus allowing the interexchange carriers access to the highway free of charge. Regulators must guard against proposed strategies that produce large price increases for basic customers as a by-product of competitive entry.

Targeted subsidies

As the prior response indicates, the Federal Law targets support to high-cost areas. Furthermore, the Federal Statute requires that the cost of providing facilities that are used in the provision of both universal service and competitive products should not be recovered exclusively from exchange service:

> The Commission, with respect to interstate services, and the States, with respect to intrastate services, shall establish any necessary cost allocation rules, accounting safeguards, and guidelines to ensure that services included in the definition of universal service bear no more than a reasonable share of the joint and common costs of facilities used to provide those services. §254(k)

Section 254(k)'s requirement is not limited to high-cost areas. Regardless of the cost-of-service, the law requires that the price of these essential services should not be used to recover the total cost of joint and common inputs. The requirement that all services make a contribution to the recovery of these costs is consistent with competitive market behavior. If the local exchange market was

competitive, the common and joint cost would be recovered from all services that use the product, not just exchange service. Exchange rates throughout the State should reflect the kind of pricing practices that are observed in unregulated markets. In unregulated competitive markets, multi-product firms do not recover the cost of customer access through the price of only one product. Instead, these firms recoup this joint cost through the prices of all the products that benefit from having access to customers.[154] This competitive benchmark should be used to determine the pricing of services included within the definitions of universal service.

---

[154]Drs. Taylor and Gordon affidavit in the universal service docket reflects a different pricing philosophy that has been promoted in other cases. In a docket before the federal communications commission, Dr. Taylor argued on behalf of Bell Atlantic that it would be "economically incorrect" to recover the cost of its broadband platform from one service, such as video dial tone. Dr. Taylor declared that "the common cost of the network platform should be recovered from all services that use the platform." Affidavit of William Taylor, Exhibit A, pp. 4-5, *In the Matter of The Bell Atlantic Telephone Companies Tariff FCC No. 10 Video Dialtone Service*, Transmittal No. 741, March 6, 1995. In the universal service docket, he takes the opposite position. Dr. Taylor argues that the appropriate economic principle is to recover the cost of the loop, a platform that is used by all switched services from one product, exchange service. Kenneth Gordon and William E. Taylor, "Comments on Universal Service," p. 8 April 12, 1996, attachment to "Comments," BellSouth Corporation, "In the Matter of Federal-State Joint Board on Universal Service," CC Docket No. 96-45, April 12, 1996.

The apparently conflicting positions of Dr. Taylor are easy to understand. In the video dialtone case, Bell Atlantic wanted to make sure that its competitive video services were not assigned too many of the common and joints of the broadband loop platform that provides both video and voice services. The cable television industry had proposed to the FCC that since video was driving the upgrade of the loop plant, the cost driving service, video, should be assigned all of the cost of the upgrade. When only a narrowband network is being subject to cost allocations, as is the case with the universal service proceedings, the LECs want to see as much of the costs allocated to monopoly services, something that can only be done because the product is not subject to competition. If the access market was competitive, it would not be possible to recover all the joint cost of the loop from one product, exchange service.

Appendix I: The inadequacy of the USO studies provided by the carriers

The USO studies provided by the carriers are fundamentally inadequate for addressing the magnitude of the universal service obligation. The studies ask the question, what is the relationship between the price of exchange service and the cost of the loop, switch, and interoffice facilities that are used for providing not only exchange service, but also other switched services. This methodology is significantly flawed for two reasons. The studies fail to distinguish between exchange facilities and facilities that are uniquely dedicated to exchange service. Secondly, the studies treat revenues in a manner that is inconsistent with the assignment of costs.

Exchange facilities versus facilities used exclusively for exchange service

First, the loop and port on the switch are not used for only exchange service. These facilities are a common input for the provision of all switched service. The local exchange facilities, generally referred to in the industry as "local exchange plant," are essential facilities that are an input to almost all services. The local exchange plant is used as a common facility to supply local telephone service, the basic service, and an increasing variety of "premium" services. The cost of the local exchange plant is affected by the need to establish the appropriate conditions for sending and receiving the specific types of communication signals for the different types of services.

There is an important distinction between basic local telephone service and the local common exchange plant. Basic local service is simply voice telephone connections within a specifically defined local area. Local exchange plant is comprised of those facilities that are physically located within the local area, but that are used to supply both local and premium services. Local exchange facilities are used by the different kinds of services that are provided over them. As such, the engineering design standards, the functional characteristics of the facilities, and the investment and expenses incurred, are determined by the variety of functions for which those facilities will be used. This means that the costs of the common facilities are caused by the multiple services, and therefore the recovery of the costs must be shared among the services provided over them. The principle that the cost-causing services

should be responsible for recovering the costs associated with their demand,[155] requires that the recovery of the local exchange plant costs be based on the traffic and engineering parameters of all the services that share the facilities, rather than just recovering all of the common and joint costs from local exchange services.

Long-distance standards dictated the design of the local network from approximately 1892 to 1983. More recently, the engineering requirements of high-speed data and video services have been the primary factors altering the design of the local exchange network.[156] Motivated in large part by the development of new information age services, local telephone companies have made a decision to integrate voice with enhanced services. Initially, high-speed data transmission and video services were largely provided by local exchange companies through facilities other than those used for plain-old-telephone service (POTS). The public switched network could not be used to provide high-speed data or video services because of the transmission limitations of the voice network. In order to provide these enhanced services, facilities had to be conditioned to meet the more stringent technical requirements of the new services.[157]

It was a slow, expensive process for the local exchange companies to condition special lines for high-speed data and video services.[158] The exchange companies established prices for conditioned lines that partly reflected the cost of conditioning the lines.[159] The primary users of high-speed data

---

[155]Mountain States Telephone & Telegraph, 82 PUR4th 64, 82 (1987).

[156]David Gabel, "Divestiture, Spin-Offs, and Technological Change in the Telephone Industry--A Property Rights Analysis," 3 Harvard Journal of Law and Technology (1990): pp. 75-102.

[157]Thomas P. Byrne, Ron Coburn, Henry C. Mazzoni, Gregg W. Aughenbaugh, and Jeffrey L. Duffany, "Positioning the Subscriber Loop Network for Digital Services," IEEE Transactions on Communications 30 (Sept. 1982), pp. 2006-2010.

[158]Byrne, et. al.; and G.J. Greco and D.H. Morgen, "Applications of Digital Loop Carrier in the `80s," National Telecommunications Conference (New York: IEEE, 1981), p. 3.1.2-3.1.3.

[159]The price may have understated the entire cost of these emerging competitive services. United States v. Am. Tel. & Tel. Co., 552 F. Supp. 131, 162, 188 (D.D.C. 1982), aff'd sub nom. Maryland v. United States, 460 U.S. 1001 (1983).

and video services, large business customers, were dissatisfied with the price, as well as the delay in obtaining the private lines that were conditioned to meet their more stringent requirements. These factors encouraged businesses to construct their own private networks, and to obtain telecommunication services from other vendors.[160]

Local exchange companies were understandably concerned about large businesses using alternative telecommunication suppliers. The exchange companies perceived voice telephony as a slow-growing industry, and, in order to sustain and increase profit growth, they wanted to be major players in the potentially rapidly growing provision of information age services.[161] In the late 1970s, the exchange companies concluded that replacing their analog with a digital network was the "key" to future success in the emerging information service markets.[162]

The digital network improves the ability of the local exchange companies to market high-speed data services, and this may bring firms that transmit large volumes of data back onto the public switched network.[163] Furthermore, in the foreseeable future, through the deployment of fiber optic technology in the plant that extends from the switch to the customer's location, it will be easier for the utilities to provide video services.

---

[160]Eli Noam, "The Public Telecommunications Network: A Concept in Transition," 37 Journal of Communications 30 (1987); John M. Griffiths, "ISDN Network Terminating Equipment," 30 IEEE Transactions on Communications (1982), 2137; Roger G. Noll, "The Future of Telecommunications Regulation," in Telecommunications Regulation Today and Tomorrow, ed. Eli M. Noam (1983), 43; Re Pacific Bell, 69 PUR4th 225, 236 (1985); and Jane L. Racster, Michael D. Wong, and Jean-Michael Guldmann, "The Bypass Issue: An Emerging Form of Competition in the Telephone Industry," National Regulatory Research Institute publication 84-17.

[161]William Lehr and Roger C. Noll, "ISDN and the Small User: Regulatory Policy Issues," 1, Center for Telecommunications and Information Studies, Columbia University (1989).

[162]See, for example, Haur Ogiwara, and Yasukazu Terada, "Design Philosophy and Hardware Implementation for Digital Subscriber Loops," 30 IEEE Transactions on Communications (1982), 2057.

[163]Griffiths, "ISDN Network Terminating Equipment," 2137. See, also, A. A. Dogterom, "Is the ISDN Concept Realistic?," Proceedings 1982 International Symposium on Subscriber Loops and Services (1982), p. 15.

The technological history of the industry suggests that the term "local exchange network" is a misnomer. It was really a toll, or long distance exchange network, that is now becoming an integrated broadband network, which also has the capacity to provide local telephone service.

Recovering the cost of the local loop

The local loop is a kiosk that is used to provide customers dial tone, or access to the network. Dial tone is not a service;[164] rather it is an input to the production of toll and local exchange services. Since access is a shared facility, its costs should not be recovered from only one service. In the future, the loop will also provide access to video and high-speed data services. While the cost of the loop that provides dial tone can be measured, there is no product, dial tone, which is a separable service of the telephone company. Rather, the loop is an input used to provide a number of services.

Since the loop is used to provide many services, the incremental cost to local exchange service of using the loop is essentially zero. This follows from the definition of total service long run incremental cost (TSLRIC). The total service long run incremental cost of a given service is equal to the difference between the total forward looking long run costs of the firm and the total forward looking long run cost of that firm if it offered everything it currently offers except the service in question. TSLRIC excludes all joint costs from being attributable to one service, and only includes costs which can be directly attributable to a service.

Since the local loop is used to provide many different products, its costs should not be considered exclusively a local exchange service cost. Instead, the loop is an exchange facility cost

---

[164]"The defining characteristic of a service is that it is or would be demanded in its own right." Alfred Kahn and William Shew, "Current Issues in Telecommunications Regulation Pricing," Yale Journal on Regulation 200, 201 (1987). Jerry Hausman, testifying on behalf of Pacific Bell, correctly stated that "nobody would buy a local loop just because it's a local loop." *"In the Matter of Alternative Regulatory Framework for Local Exchange Carriers,"* California PUC 87-11-033, March 13, 1992, transcript page 19126. Instead customers purchase switched telephone service in order to place or receive local and toll calls. Usage is the service that is supplied by telephone companies.

which should be recovered from the different services that share the facilities. The proportion of the joint cost of the loop recovered from different switched services should reflect customer's willingness to pay for the different products that use the loop.[165]

[165]The loop is a joint good because local and toll usage on an access line during the peak hour is in the order of five minutes. Once a copper loop is installed, the additional cost of providing usage over the same facility is essentially zero. The cost attribute usually used to describe the copper loop is non-traffic sensitive plant. The nomenclature reflects the lack of congestion in the local loop. Panzar defines a joint good as an input "[t]hat is, once acquired for use in producing one good, they are costlessly available for use in the production of others. John C. Panzar, "Technological Determinants of Firm and Industry Structure." in Handbook of Industrial Organization, vol. I, eds. Richard Schmalensee and Robert Willig (Elsevier Science Publishing, 1989), p. 17.

Appendix II: Vita of Dr. Gabel

VITA
DAVID J. GABEL

ADDRESS: Queens College
Department of Economics
Flushing, NY 11367
718-997-5452

65 Strathmore Rd..
Apt. 38
Brookline, MA 02146
617-734-3813
DAVIDGABEL@AOL.COM

DEGREES: B.A. Boston University, magna cum laude, 1976, Awarded distinction in history.
M.S. University of Wisconsin-Madison, 1982, economics.
Ph.D. University of Wisconsin-Madison, 1987, economics.

DISSERTATION TITLE: The Evolution of a Market: The Emergence of Regulation in the Telephone Industry of Wisconsin, 1893-1917.

FIELDS OF INTEREST: Industrial Organization, Regulation, Economic History.

WORK EXPERIENCE:

Queens College. 1987-
Associate Professor of Economics. Teach industrial organization, statistics, econometrics, microeconomics, business economics, and economic history.

Graduate School, City University of New York. 1988-
Teach Industrial Organization.

Columbia University. 1988-
Affiliated Research Fellow, Center for Telecommunications and Information Studies, Graduate School of Business.

Ohio State University. 1991-
Institute Associate, National Regulatory Research Institute.

Northeastern University. 1993-95
Visiting Research Associate.

Michigan Divestiture Research Fund. 1986-87.

Wrote report that identified the cost of telephone services in the information age. Quantified the stand-alone and incremental cost-of-service of different telephone services.

Office of Chief Economist, Wisconsin Public Service Commission, 1979-1980 and 1983-1985.

Directed cost study that quantified the stand-alone and incremental cost-of-service of different telephone services. Supervised cost study of local measured service. Written and oral testimony presented on costing and pricing issues.

New York State Consumer Protection Board, 1985-1986.

Presented expert testimony to the New York Public Service Commission. Quantified the incremental and embedded cost of message and access services, and the elasticity of demand for various telephone services.

American Telephone and Telegraph Company, 1982-1983.

Responsible for developing interfaces between engineering simulation models and a financial forecasting system. Analyzed the impact of changes in demand on capital expenditures.

Dean Witter Reynolds, 1982.

Advised management on the procurement of telephone networks and hardware. Developed economic model for analyzing different capital expenditure alternatives.

Richard Gabel, Communication Consultant, Summer 1976 and 1980, and 1981-82.

Researched the technical impact long distance service had on the design of the local telephone network. Analyzed Bell Operating Company's forecasting procedures. Assisted in the analysis of private line costing and pricing issues raised in antitrust litigation.

Massachusetts Department of Public Utilities, 1977-1979.

Developed costing and pricing procedures for gas, electric, and telephone services. Hearing examiner.

Yadkin Valley Telephone Corporation, 1976-1977.

Outside plant and PBX installations.

TEACHING EXPERIENCE:

1994- Teach course on how to conduct a cost study at Michigan State University NARUC training seminar.

1987- Teach industrial organization, regulation, microeconomics, business economics, statistics, econometrics and economic history.

1988 Teach course at Ohio State University on how to calculate the cost of telephone services.

1980-81, 1984. University of Wisconsin. Teaching Assistant for introductory economics and economic history.

SERVICE AT QUEENS COLLEGE

1992-93, 1994-96,	Chair of Evening Program, Department of Economics
1992-93	Faculty Advisor Economic Honor Society
1991-93	Department of Economics Curriculum Committee
1992-93	Coordinator, Social Science Research Lab

PUBLICATIONS POST-QUEENS COLLEGE EMPLOYMENT:

"Competition-Enhancing Costing and Pricing Standards for Telecommunications Interconnection," Monograph Published by the National Regulatory Research Institute, Ohio State University, 1996. 50 pages.

Book Review of Richard Vietor's Contrived Competition: Regulation and Deregulation in America, The Annals of the American Academy, March 1996, pp. 234-35.

"Prices, costs, externalities and entrepreneurial capital: lessons from Wisconsin," (with David Rosenbaum), Antitrust Bulletin (Fall 1995), pp. 581-608.

"Pricing Voice Telephony Services: Who is Subsidizing Whom?" Telecommunications Policy 19 (August 1995), pp. 453-64.

"Federalism: An Historical Perspective." in Crossing Lines: American Regulatory Federalism and the Telecommunications Infrastructure (1995) (ed. Paul Teske), pp. 19-31.

"Privatization, Deregulation, and Competition: Learning From the Cases of Telecommunications in New Zealand and the United Kingdom," (with William Pollard). Monograph Published by the National Regulatory Research Institute, Ohio State University, 1995. 114 pages.

Current Issues in the Pricing of Voice Telephone Services," Monograph Published by the American Association of Retired Persons, 1995.

"Economies of Scope in the Local Telephone Market." (with Mark Kennet). Journal of Regulatory Economics. Nov. 1994, pp. 381-398.

"Competition in a Network Industry: The Telephone Industry, 1894-1910," Journal of Economic History, September 1994, pp. 543-572.

"AT&T's Strategic Response to Competition: Why Not Preempt Entry?" (with Joan Nix). Journal of Economic History, June 1993, pp. 377-387.

"Regulatory Assessment of Investments in Telephone and Electric Utilities" (with Joan Nix). Law and Policy, vol.15 (April 1993), pp. 123-37.

Book Review of Claude Fischer's America's Calling, Spectrum Magazine, June 1993.

"Pricing of Telecommunication Services." with Mark Kennet. Review of Industrial Organization. 1993. pp. 1-14; and "Reply to Taylor," 7 pages.

"The Effects of Divestiture, Privatization, and Competition on Productivity in U.S. and U.K. Telecommunications: a Brief Note," Review of Industrial Organization. 1993 pp. 63-66.

"Estimating the Cost Structure of the Local Telephone Exchange Network." (with Mark Kennet), Monograph Published by the National Regulatory Research Institute, Ohio State University, 1991. 150 pages.

"Regulation of the Telephone Industry," Journal of Economic Issues, (1991): 597-605.

"An Application of Stand-Alone Costs to the Telecommunications Industry," Telecommunications Policy, February 1991, pp.75-84.

"Using Process Data to Estimate Changes in the Cost Structure of an Industry--A Case Study of the Telephone Industry," with Mark Kennet, in Marginal Cost Techniques for Telephone Services: Symposium Proceedings (Columbus: National Regulatory Research Institute at Ohio State University, 1991), pp. 311-347.

"Divestiture, Spin-Offs, and Technological Change in the Telecommunications Industry--A Property Rights Analysis." 3 Harvard Journal of Law and Technology (1990), pp. 75-102.

"Deregulation: Should the Local Telephone Market be Next?" New England Law Review, Volume 24 (1989), pp. 39-61.

"Rejoinder," Telecommunications Policy, vol. 12, September 1988, pp. 288-89.

FORTHCOMING PUBLICATIONS:

"Competition-Enhancing Costing and Pricing Standards for Telecommunications Interconnection," National Regulatory Research Institute. 1996. NRRI 96-22.

"On the Validity of Capacity Costs," (with James D. Cowie). Proceedings of BRIC-X, National Regulatory Research Institute. 1996.

Opening Networks to Competition: The Regulation and Pricing of Access. Coeditor with David Weiman. Kluwer Academic Press.

Book Review of Andrew Davies' Telecommunications and Politics: The Decentralised Alternative. Research Policy.

"Private Telecommunications Networks: An Historical Perspective." in Public Networks Public Objectives, Ed. A. Wolfson, Elsevier Science, 1996.

"AT&T's Transition to Automatic Switching: Market versus Institutional Influences," (with Joan Nix), Journal of Economic Issues.

PRE-QUEENS COLLEGE PUBLICATIONS:

"A Study of the Incremental and Stand-Alone Cost of Telephone Service," Wisconsin Public Service Commission, 1985.

"Cost Characteristics of Michigan Bell: A Study of the Stand-Alone and Incremental Costs for Michigan Bell's Major Categories of Service," (with Richard Gabel), 1987. Research done for, and distributed by Michigan Divestiture Research Board.